Periodontal and Peri-implant Plastic Microsurgery:

Minimally Invasive Techniques with Maximum Precision

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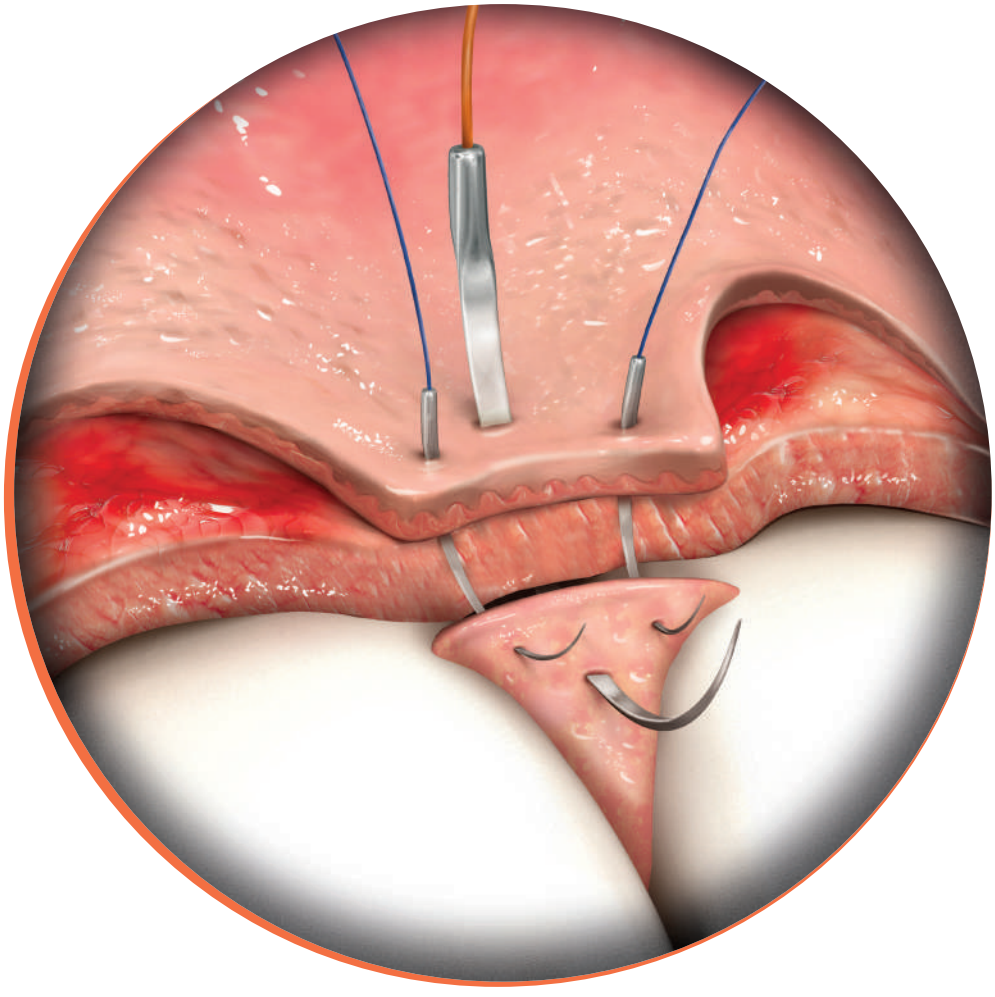
Glécio Vaz de Campos, DDS Cláudio Julio Lopes, DDS



QUINTESSENCE PUBLISHING

Berlin | Chicago | Tokyo
Barcelona | London | Milan | Mexico City | Moscow | Paris | Prague | Seoul | Warsaw
Beijing | Istanbul | Sao Paulo | Zagreb

This book was originally published in Portuguese under the title *Microcirurgia Plástica Periodontal e Peri-Implantar* by Napoleão-Quintessence (São Paulo) in 2019.

Library of Congress Cataloging-in-Publication Data

Names: Campos, Glécio Vaz de, author. | Lopes, Cláudio Julio, author.
Title: Periodontal and peri-implant plastic microsurgery / Glécio Vaz de Campos, Cláudio Julio Lopes.
Other titles: Microcirurgia plástica periodontal e peri-implantar técnicas minimamente invasivas com máxima precisão. English
Description: Batavia, IL : Quintessence Publishing Co, Inc, [2021] | Translation of Microcirurgia plástica periodontal e peri-implantar técnicas minimamente invasivas com máxima precisão. 2019. | Includes bibliographical references and index. | Summary: "Demonstrates the microsurgical principles and procedures underpinning periodontal and peri-implant plastic microsurgery, including how to practice these procedures on training models and then execute them with maximum precision in the clinic"-- Provided by publisher.
Identifiers: LCCN 2020020014 | ISBN 9780867158199 (hardcover)
Subjects: MESH: Periodontal Diseases--surgery | Microsurgery--methods | Dental Implantation--methods | Periodontics--methods | Esthetics, Dental
Classification: LCC RK450.P4 | NLM WU 240 | DDC 617.6/32059--dc23
LC record available at https://lccn.loc.gov/2020020014

QUINTESSENCE PUBLISHING USA

Quintessence Publishing Co, Inc
411 N Raddant Rd
Batavia, IL 60510
www.quintpub.com

5 4 3 2 1

Editor: Leah Huffman
Editorial Assistant: Samantha Smith
Design: Sue Zubek
Production: Sarah Minor

Printed in China

Tribute to Dr Dennis Shanelec

The father of periodontal microsurgery

In the last week before finishing this book, we received the news that Dr Shanelec had passed away. The thrill in concluding this work was dampened by the shock of the interruption of Dr Shanelec's brilliant journey. I had few personal contacts with him, but they were very intense. The first one was in 1996, when I attended his microsurgery course at the Microsurgery Training Institute in Santa Barbara, California. It changed my career and my personal life because it enabled me to tread a new path and seek for new horizons. The second personal contact was in Huntington Beach, California, at the AMED (Academy of Microscope Enhanced Dentistry) annual meeting. Surprisingly, right after my lecture, Dr Shanelec was waiting for me on the pulpit steps, where he congratulated me on my speech. So I thanked him, saying that the presentation was the fruit of the microsurgical principles he had taught me. His generosity in saying that I had already raised the bar stayed forever in my memory. Dr Shanelec's words were very striking and a great stimulus for the development of this book. Thank you, Dr Shanelec, for your knowledge and, above all, for your wisdom, which completely changed people and the world of periodontics.

–Glécio Vaz de Campos

Dr Dennis Shanelec was undoubtedly a milestone in the contemporary dentistry scene, both in periodontics and in implantology. As a master, he left us an invaluable legacy of technical and philosophical innovations in the field of periodontal and peri-implant plastic microsurgery, hitherto never achieved. I had the honor and privilege of receiving many of his teachings through some of his best disciples, now seeds scattered throughout the world. As a great human being, he left us inspiring records of kindness, compassion, and humility—an example to be followed by the next generations.

–Cláudio Julio Lopes

Contents

Foreword

It is with a mixture of pride and satisfaction that I received the invitation of Glécio Vaz de Campos to preface this magnificent work—his legacy. There are several meanings to the word *legacy*. Among them, for example, is knowledge passed on to the next generations or something transmitted or acquired that is left for a whole and not just for one.

The path traveled was long and arduous, but Glécio is undoubtedly a visionary. The visionary is one who has the rare ability to combine vision with competence. He does not see only the present; he also sees the future. He can predict trends and anticipate changes rather than simply being hit by them. Looking at it today, that's precisely it. The story of this journey begins in 1995, during the annual congress of the American Academy of Periodontology. After attending this conference and then attending an immersion course taught by Professor Shanelec in Santa Barbara, California, the time had come to introduce periodontal plastic microsurgery in Brazil. This was 24 years ago.

Glécio set up the first laboratory for developing the skills required to perform microsurgical procedures in his private clinic, having already trained many professionals from Brazil and abroad. But still that was not enough. More was needed. Knowledge needed to be diffused, not just kept in the mind of a brilliant surgeon. His courses on periodontal plastic surgery were brought to the São Paulo Dental Association, where he now supervises a multidisciplinary microsurgery laboratory. Since then, Glécio has delivered countless microsurgery-related courses and lectures and published several book chapters and articles. But still he wanted to demonstrate the importance of periodontal and peri-implant plastic microsurgery and present a step-by-step method, from laboratory to daily clinical practice, safely and predictably. Hence what you are now holding in your hands.

This book, distributed in nine carefully written and logically sequenced chapters, is intended to serve not as a manual but as a practical guide. The reader is first taught the fundamentals of microsurgery and from there can develop the skills through laboratory training where ergonomics and magnification are emphasized. Further on, the main techniques of periodontal plastic microsurgery are didactically presented. This beautiful work is undeniably a gift to dental professionals.

To paraphrase the enologist Luís Henrique Zanini, "A vineyard requires sensitivity; it takes humanity. Masters and doctorates are of no use if we lose our identity. It takes physical contact with the vineyards, with the grape; you literally have to get your hands on the wine." Likewise, to be an educator and an excellent periodontal surgeon, you need sensitivity. Masters and PhDs are no good. We have to literally lay our hands on it. And this is Glécio's gift and legacy to us.

Sérgio Kahn, DDS, MSc, PhD
President of the Brazilian Society of Periodontology

Foreword

It's a true honor and privilege to write a foreword for this significant new textbook full of valuable information and new perspectives in the field of dental microsurgery. The book is a true landmark in clinical dentistry and is carefully presented by Drs Glécio Vaz de Campos and Cláudio Julio Lopes and their coauthors, incorporating the key fundamentals and clinical steps in periodontal and peri-implant plastic microsurgery. The written content comprehensively presents the scientific evidence and clinical relevance in the ever-growing field of microsurgery, with many beautifully illustrated photographs and diagrams. The book clearly showcases that dentistry is swiftly moving toward minimally invasive treatment in the nonsurgical and surgical fields, and critical key points and important elements like magnification, microinstruments, and minimally invasive techniques have become the new gold standard of high-quality dentistry.

Specialists, general practitioners, and dental students interested in cutting-edge science and surgical treatment will be able to understand and embrace the new directions of minimally invasive surgery for the benefit of patient comfort and long-term results and will be able to incorporate the essential steps of this new discipline in their office.

The authors show that discipline, focus, and early passion for their field have moved them from students to mentors and leaders. I believe that many new students will have the same potential if they put forward a similar effort and dedication to this exciting field of microsurgery. Thank you, Dr Glécio and Dr Cláudio, for your dedication to enhance our understanding of microsurgery—your textbook will surely reach the level of a true standard.

Sascha A. Jovanovic, DDS, MS
Chairman, glDE Institute

Preface

Periodontal and peri-implant plastic microsurgery have become particularly valuable in periodontics and implantology because of the potential for primary intention healing. This is related to the development of precise surgical techniques, gentle tissue manipulation, patient well-being, fast healing, and predictable outcomes.

Our decision to start this book 3 years ago was based on 24 years of dedication to develop a minimally invasive surgical philosophy and the accumulation of decades of clinical experience. Moreover, in recent years, the periodontal literature has gradually demonstrated with scientific evidence the importance of microsurgical principles. Further, there have been no studies contradicting this value or showing any possible detriment to the practitioner or patient when following this philosophy. We hope that more and more comparative clinical studies will contribute to the scientific consolidation of periodontal microsurgery, just like what has happened in medical specialties.

In this book, we sought to offer content that included the minimally invasive philosophy, the protocols for the development of new skills for the surgeon, the systematization of microsurgical techniques, the solutions for soft tissue defects, and the correlation of these microsurgical principles with implantology. We also wanted to address digital planning and microsurgery for clinical crown augmentation for esthetic purposes as well as proper ergonomics for surgeons who use magnification, which is crucial for their health, comfort, and quality of life.

Particular highlights of the writing process included presenting the principles that direct periodontal and peri-implant microsurgical techniques as well as guiding those interested in a safe pathway to their first microsurgery. Our goal was to stimulate discussion of the advantages and disadvantages of microsurgery as well as to encourage the development of increasingly conservative, biologic, and predictable procedures.

This book is intended for *all* professionals (beginners or experienced) seeking a minimally invasive surgical philosophy with a focus on respecting biologic principles, preserving healthy tissues, enhancing patient well-being, and achieving satisfaction with the esthetic results of soft tissues. Happy reading!

Acknowledgments

From Glécio Vaz de Campos

To my coauthor, Dr Cláudio Julio Lopes, I would like to thank you for your partnership and for your indispensable organization, seriousness, and persistence in developing and completing this book. Your ability to conceptualize the minimally invasive philosophy in illustrations catalyzed and enhanced the publisher's graphic arts work. Your long experience, competence, and fidelity to microsurgical principles were decisive in the collaboration of the text and in the revision of the chapters. Coupled with all this, my family and I have made sure that, besides being a brilliant periodontal microsurgeon, you are a great friend!

To Dr Fátima Tonello Vaz de Campos, my wife, I make a point of recording your direct participation in the writing of this book. You selected and organized the clinical cases, edited the videos, were creative in naming techniques, and were especially encouraging in the most challenging times. Your good humor, creativity, and intelligence inspired us and guided us through obstacles.

Many thanks to my dear children, Alexandre and Marcelo, and my daughters-in-law, Ludmila and Cyntia, for your constant encouragement. To my mother, Marlene, for the joy of your conviviality. I miss (in memoriam) my father, Dr Alfredo, for the continual example of life, and my eternal brother, Dr Márcio, whom we miss so very much. Moreover, I thank God indeed for the arrival of Felipe, my first grandson.

I also thank the Minimally Invasive Dentistry team—Cristiane Bissoli, Luciane Bardela Cavalaro, and Hélen Elisa Pessoto—for your competence, dedication, and friendship.

To the Napoleão Publishing House/Quintessence Publishing in Brazil, particularly directors Guilherme and Leonardo Napoleão, and the team, I thank you for the opportunity to develop this creative work without restrictions and, above all, for the stimulus to surpass our limits.

From Cláudio Julio Lopes

To Dr Glécio Vaz de Campos, my sincere thanks for the invitation and the privilege of being able to participate as coauthor to this brilliant project. Throughout our 2-year journey of hard work, I have had the opportunity to live and learn from this great human being and professional who guides his life on discipline, organization, and seriousness, essential qualities for those who embrace microsurgery as a philosophy of work. I appreciate your patience, respect, friendship, and generosity throughout the writing of this book.

To Dr Fátima Tonello Vaz de Campos, for her essential participation in all stages of the preparation of this work. I thank you for all your kindness, professionalism, joy, common sense, and friendship, which were fundamental for us to reach the end of our work.

To my partner, Mauricio de Melo Lacerda, for the unflagging patience, encouragement, and collaboration over the last few years that have been instrumental in this process.

To my dear parents, Antonio and Lucilia, brothers, and family for the affection and encouragement always present.

To the entire Microdent team for their understanding and availability during the writing of this book.

To my friend Josias Silva for his collaboration and excellent work in the photographic documentation of clinical cases of clinical crown augmentation.

To the Napoleão Publishing House/Quintessence Publishing in Brazil, particularly directors Guilherme and Leonardo Napoleão, for the opportunity to make this dream come true. Thank you for the patience, support, and talent of the entire team.

To Quintessence Publishing Chicago, specifically William G. Hartman, our sincere gratitude for believing in the content of our work. And to Leah Huffman and Sarah Minor for the fancy editorial work and production that brightly enhanced the book's final outcome.

"Life is not about goals, achievements and finish lines … it's about who you become along the way." —*Gisele Ferreira*

About the Authors

Glécio Vaz de Campos, DDS, received his DDS degree from the Universidade Estadual Paulista (UNESP) in Araraquara, Brazil, in 1982. After he specialized in periodontics and prosthetics, several years of clinical practice led him to explore new techniques focusing on periodontal plastic surgery. In 1996, he was qualified on this subject at the Microsurgery Training Institute in Santa Barbara, California. He had a significant role in introducing periodontal and peri-implant plastic microsurgery techniques to Brazil and expanding the use of the operative microscope there. From 2000 to 2004, Dr Campos served as Director of the Operative Microscopy Department at the São Paulo Dental Association (APCD), where he organized the largest training facility on operative microscopy in South America. Dr Campos has coauthored 16 books related to periodontal and peri-implant plastic microsurgery, as well as scientific articles published in Brazil and abroad. Currently he maintains private practices in Jundiaí and São Paulo, Brazil, where he focuses on periodontal and peri-implant plastic microsurgery and offers regular training courses in his private microscopy laboratory in Jundiaí.

Cláudio Julio Lopes, DDS, received his DDS degree from São Paulo City University in 1989. After specializing in periodontics, he became an assistant professor of periodontics at Camilo Castelo Branco University in São Paulo, Brazil, where he stayed from 1990 to 2000. He then moved on to become coordinator of the Periodontal Plastic Surgery and the Introduction to Microsurgery courses at the São Paulo Dental Association (APCD), which he continued until 2015. In 2014, he specialized in implantology with the Brazilian Dental Association (ABO), and in 2017, he qualified in reconstructive microsurgery at the Institute of Orthopedics and Traumatology at the University of São Paulo. He maintains a private practice in São Paulo, Brazil.

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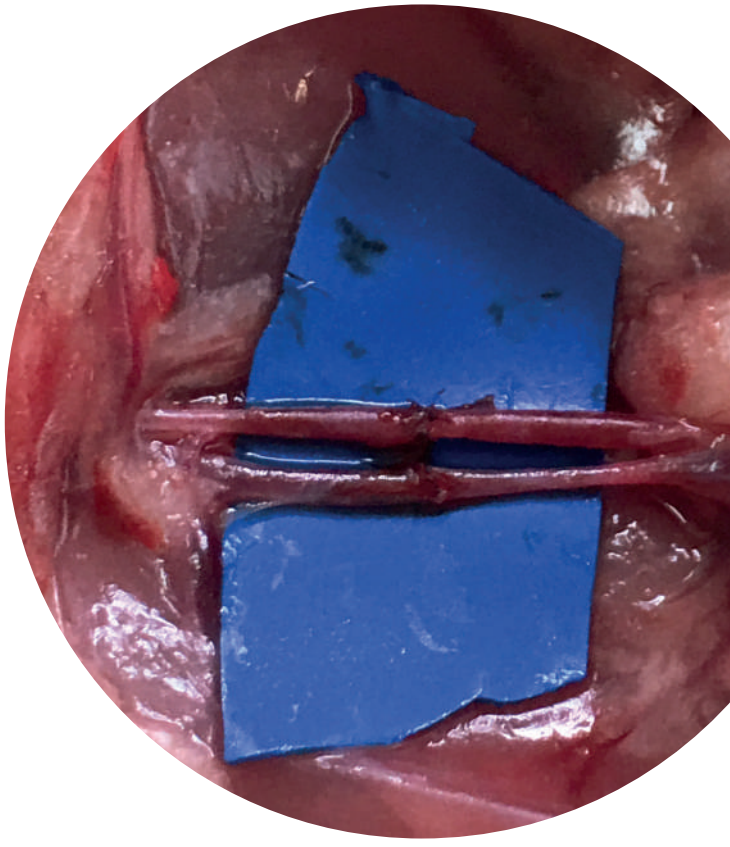
Minimally Invasive Surgery

Clinical outcomes are enhanced when the most accurate surgical approaches are performed using magnification systems, precise instruments, and microsurgical materials.



Reconstructive Vascular Microsurgery

Microsurgical techniques have a long history, but the broad application of vascular microsurgery in different medical specialties is a relatively recent phenomenon. The history of microsurgery is directly related to the development of optical magnification of the operatory field and the refinement of microinstruments.[1]

The first techniques to use the microscope were developed for research purposes. Carrel's work on vascularized organ transplantation in 1902 seems to be the first record of the application of microsurgical techniques.[2] Otorhinolaryngology was the first specialty to consider the benefits of microsurgery, and eye and ear microsurgery led to the development of more sophisticated operative microscopes, equipment, and techniques.

Jacobson et al were the first to publish on the use of microsurgery for small blood vessel anastomosis,[3] and since then the use of magnifying glasses and microscopes has grown and developed widely. Today, more complicated procedures are possible both in animal models and clinically in patients. The most advanced techniques are initially developed and trained in animal models and then transferred to clinical use. Magnifying loupes are used for lower magnification levels (2× to 8×), while operative microscopes work at 9× to 40× magnification.

Otorhinolaryngology was the first specialty to consider the benefits of microsurgery.

Microsurgery did not develop as a subspecialty of medicine. On the contrary, microsurgical techniques have been incorporated by a wide variety of specialties, such as pediatric surgery, neurosurgery, plastic surgery, and vascular surgery, being an essential element in the outcome of many surgeries and treatments.[4]

Learning microvascular techniques in the microsurgery laboratory is the first step for surgeons who wish to adhere to this treatment philosophy. Successful training in microvascular techniques requires excellent concentration and persistence, which may lead to frustration at first. The training environment should

be calm and preferably without distractions of any kind. In order to maximize training and lessen the physiologic tremor that almost everyone experiences to some degree, appendicular muscle impact exercises, caffeine, and nicotine should be avoided 24 hours before any training. Also, the activity should be interrupted for 5 minutes every hour of training in order to reduce fatigue.

The instruments used for microvascular anastomosis include jeweler's micro pliers, microscissors, microclips, a 10-mL syringe with 90-degree angled blunt insulin needle, clip holder, no. 11 scalpel, retractors, and monofilament sutures. The suture size should be 11-0 for vessels with 0.5-mm diameter, 10-0 for vessels with 1-mm diameter, and 9-0 for vessels with 2-mm diameter.

Surgeons must know how to work the operative microscope lens system and should opt for the appropriate magnification for the work to be performed. Binocular vision and work in the center of the field are also crucial for proper technique.

Once microsurgery trainees know the technical environment, they can begin to acquire and develop the skills for the microsuture technique. Initially, the training for this technique is practiced on nonanimal models prepared especially for this procedure. Suturing a rubber model is a training step that precedes suturing living and delicate structures and uses a wooden board with a hollow center covered with a rubber or latex strip. Several cuts in different shapes and sizes should be made in the rubber strip to simulate the edges of the structures that will be sutured, offering varying degrees of difficulty.[5,6]

Microsutures are made by following some basic concepts. The point of entry of the needle must be perpendicular to the entry plane; otherwise, the edge will be inverted. The distance from its entry to the edge should be three times the diameter of the needle. If this distance is not respected, the edges will overlap. The needle exit on the other side should also be perpendicular to the cut in the rubber. As the surgeon's confidence and skill improve, the diameter of the suture should decrease, and the microscope should be zoomed in progressively.[5,6]

Following initial training on rubber models, practice should begin on animal models. Wistar rats are the ideal animals to practice vascular microsurgical techniques in the laboratory. The rats have a suitable vascular network with many easily accessible vessels and nerves of appropriate gauge for different types of sutures. As a basis for comparison, a 300-g rat, considered the ideal size, has a 1-mm-diameter femoral artery, a 2-mm aorta, and a 1.5-mm carotid artery. The anesthetic techniques must provide an adequate chemical containment, hypnosis, and analgesia for pain to allow for a fast and smooth recovery from the anesthesia.

The most favorable areas for training in a rat model are the inguinal region (femoral artery and vein) and the cervical region (carotid artery and jugular vein). The most commonly used techniques are end-to-end and end-to-side anastomosis. After preparation and proper anesthesia of the animal, delicate subcutaneous dissection is performed, and retractors are placed on the incision margins. The vessels used in training are identified and dissected with the microscissors, individualizing them. The difference between arteries and veins is observed by three main characteristics: arteries cross over veins, have a smaller gauge, and have a thicker vascular wall. Despite the smaller size, the arteries offer easier manipulation and have more resistant walls. For this reason, they are the vessel

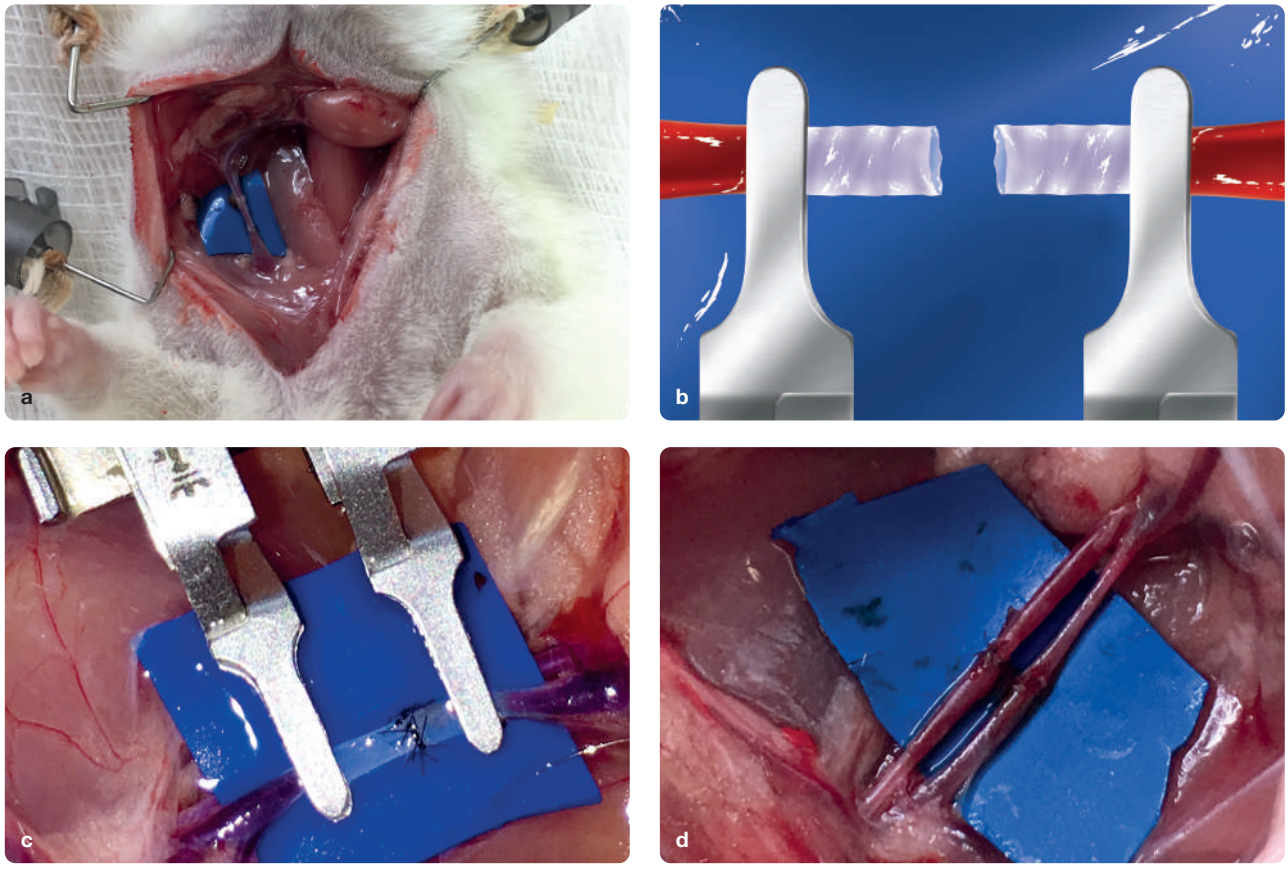


Fig 1-1 *(a)* Wistar rat prepared for laboratory training of microvascular anastomosis. *(b)* Microclip with the two stumps of the vessel stabilized for the first microsutures at positions 6 and 12 o'clock. *(c)* Exercise of microvascular anastomosis in the femoral artery finalized before removal of microclip. *(d)* The finalized femoral artery and vein microvascular anastomoses after microclip removal. Observe hemostasis achieved after microsutures.

of choice for initiating microvascular anastomosis training. Handling should be minimal to avoid spasm and injury to the vascular wall, and the vessel's outermost coat (ie, tunica adventitia) should be used to mobilize it (Fig 1-1a).

To begin the microvascular anastomosis technique, the distal and proximal microclips are placed, followed by a complete transverse incision of the vessel using microscissors. Heparinized saline solution is used to irrigate the interior of the vessel in both stumps. The anastomosis is performed with the first two sutures placed on the upper and lower poles at 12 o'clock and 6 o'clock, respectively (Fig 1-1b). A long suture termination is left for later traction in order to visualize the position of the vessel edges and obtain a symmetric suture. The next suture sites to be performed with single stitches are those corresponding to 9 o'clock, 7:30, and 10:30 (eg, the posterior wall of the vessel). In order to achieve this, the clips are rotated 10 degrees to expose this wall. The next step is to undo the rotation of the vessel and suture its anterior wall with simple stitches at 3 o'clock, 1:30, and 4:30 (Fig 1-1c). Finally, the microclips are removed, and the region of the vessel with blood inside is drained toward the anastomosis. At this point, the patency of the vessel and the possible leakage of blood through the suture points can be verified[4–6] (Fig 1-1d).

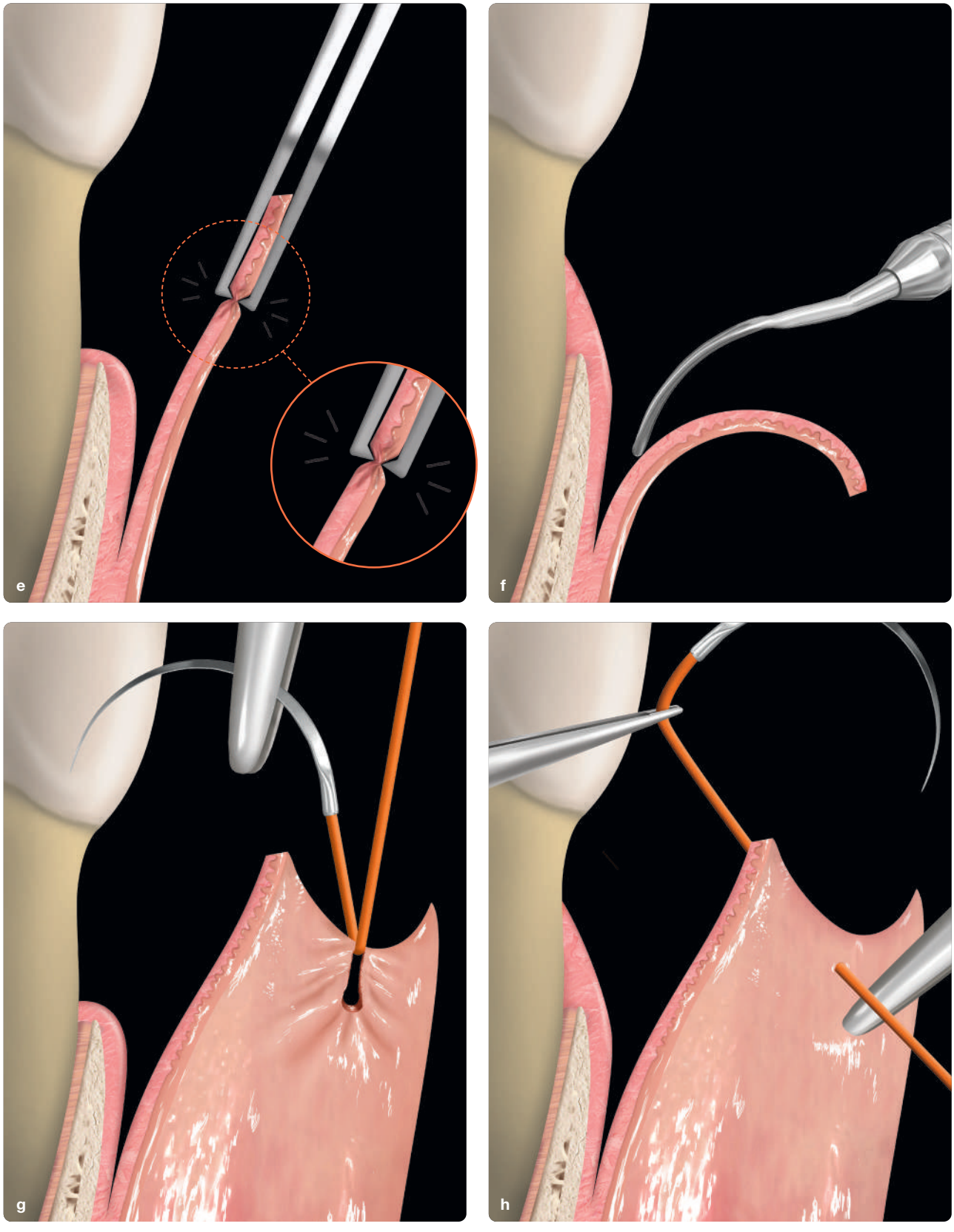


Fig 1-7 *(cont)* *(e)* Conventional macroscopic maneuvers, such as holding flaps with traumatic pliers, can tear the tissues. *(f)* Microinstruments allow delicate tissue retraction. *(g)* Improper suture threads and unrefined techniques increase needle-generated perforation. *(h)* Microsuture techniques restrict tissue perforation according to needle diameter.

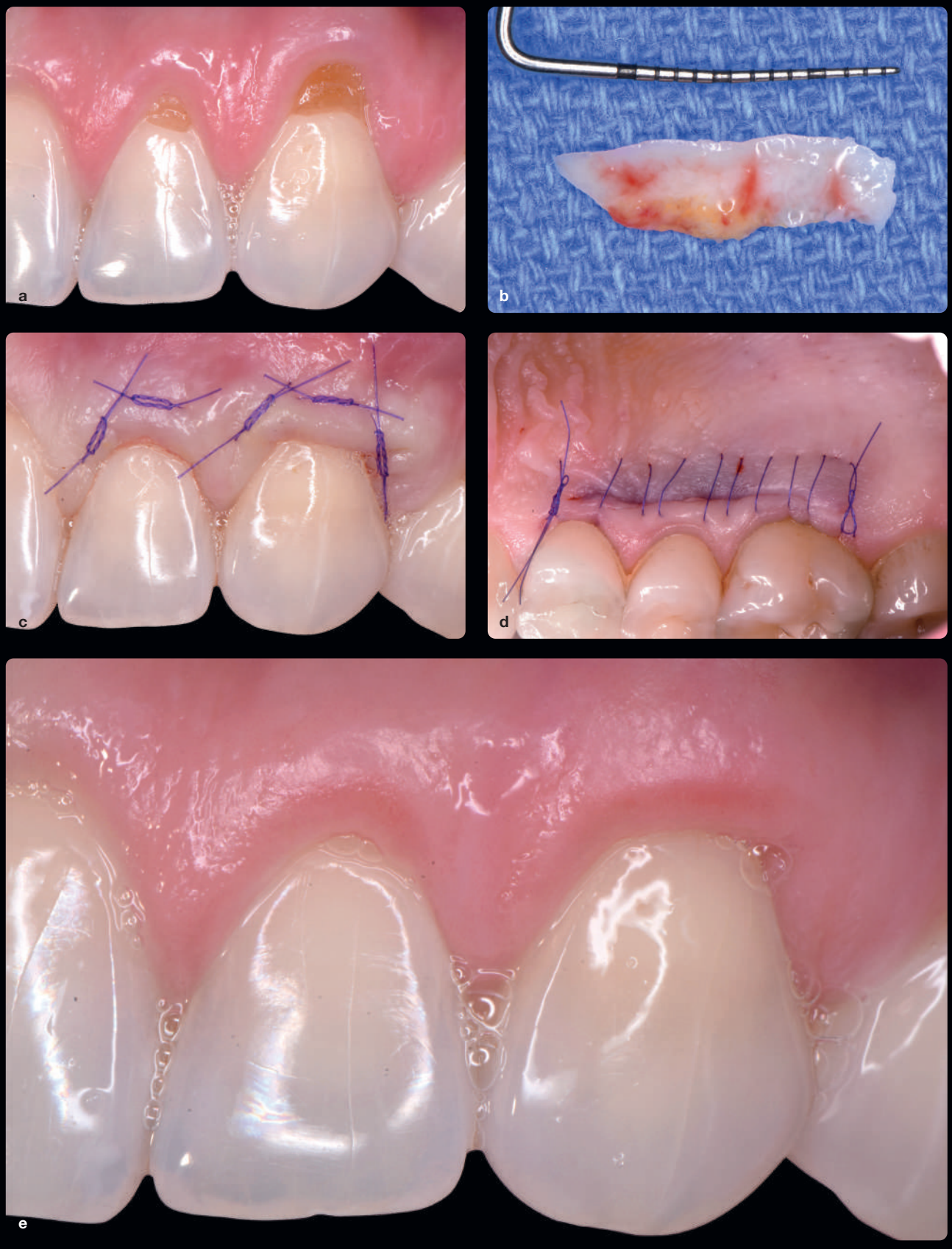
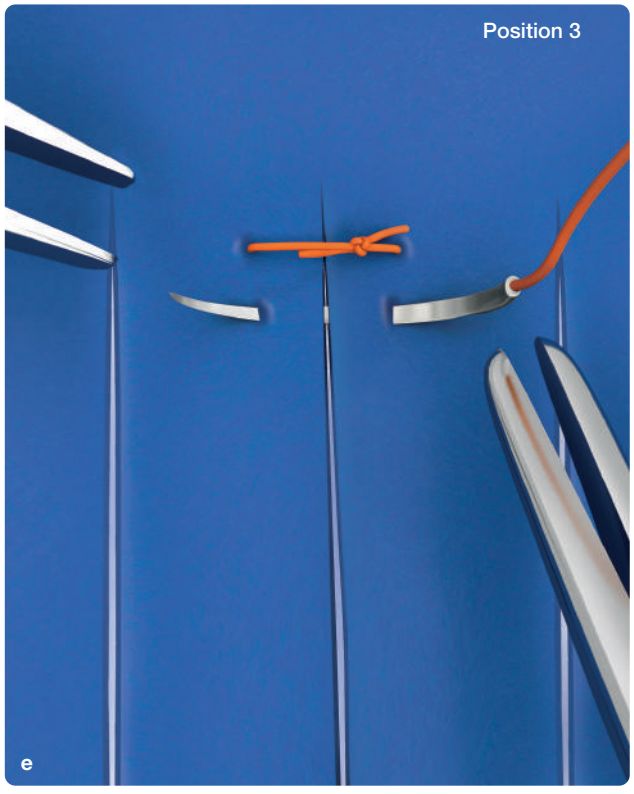


Fig 2-11 *(a)* Preoperative view of the maxillary left lateral incisor and canine. *(b)* Subepithelial connective tissue graft removed from the palate. *(c)* Recipient site immediately postoperative with microsutures properly executed. *(d)* Donor area immediately postoperative. *(e)* After healing. (Case courtesy of Dr J. David Cross.)

Fig 3-7 Working position for training with the OM. *(a)* The head and neck are in a comfortable position due to the inclination of the microscope. The cervical spine should be in a neutral position without stretching or flexing the back. This posture forces the operator to work in the laboratory as best as possible. *(b)* Note that the eyes should not touch the protective eyepiece cups. The *white line* suggests the recommended positioning for OM. The *orange line* suggests the ideal positioning that specific chairs can provide.



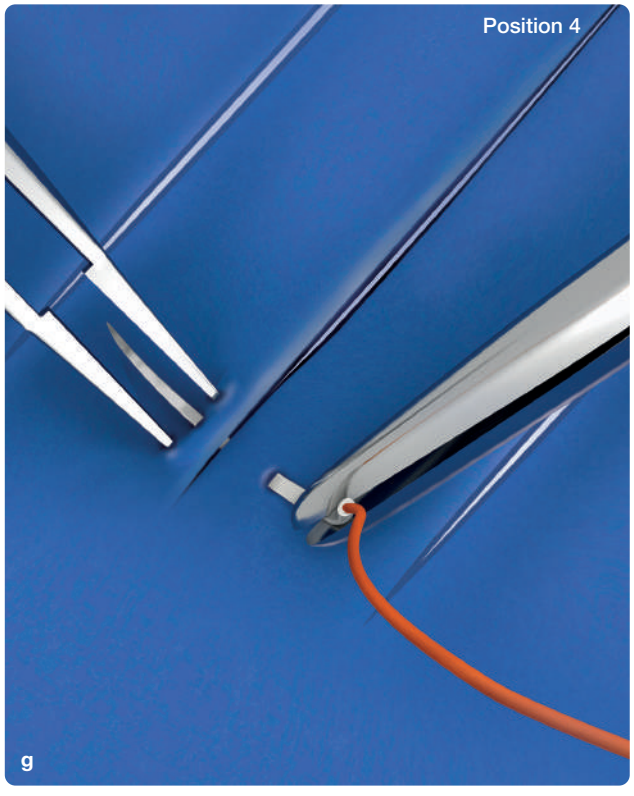


Fig 3-25 *(cont)* *(e and f)* Position 3: Turn the needle holder clockwise and position the wrist to achieve the correct direction of movement (from 3 o'clock to 9 o'clock). *(g and h)* Finally, when all these positions become natural, move to position 4, which is the most difficult of all. The incision is positioned from the right top sloping to the left base. In this awkward position, it is best to hold the needle holder with the tip facing the surgeon, and the needle penetrates from right to left, from the bottom up (movement of the right hand from the 5 o'clock to 11 o'clock position).

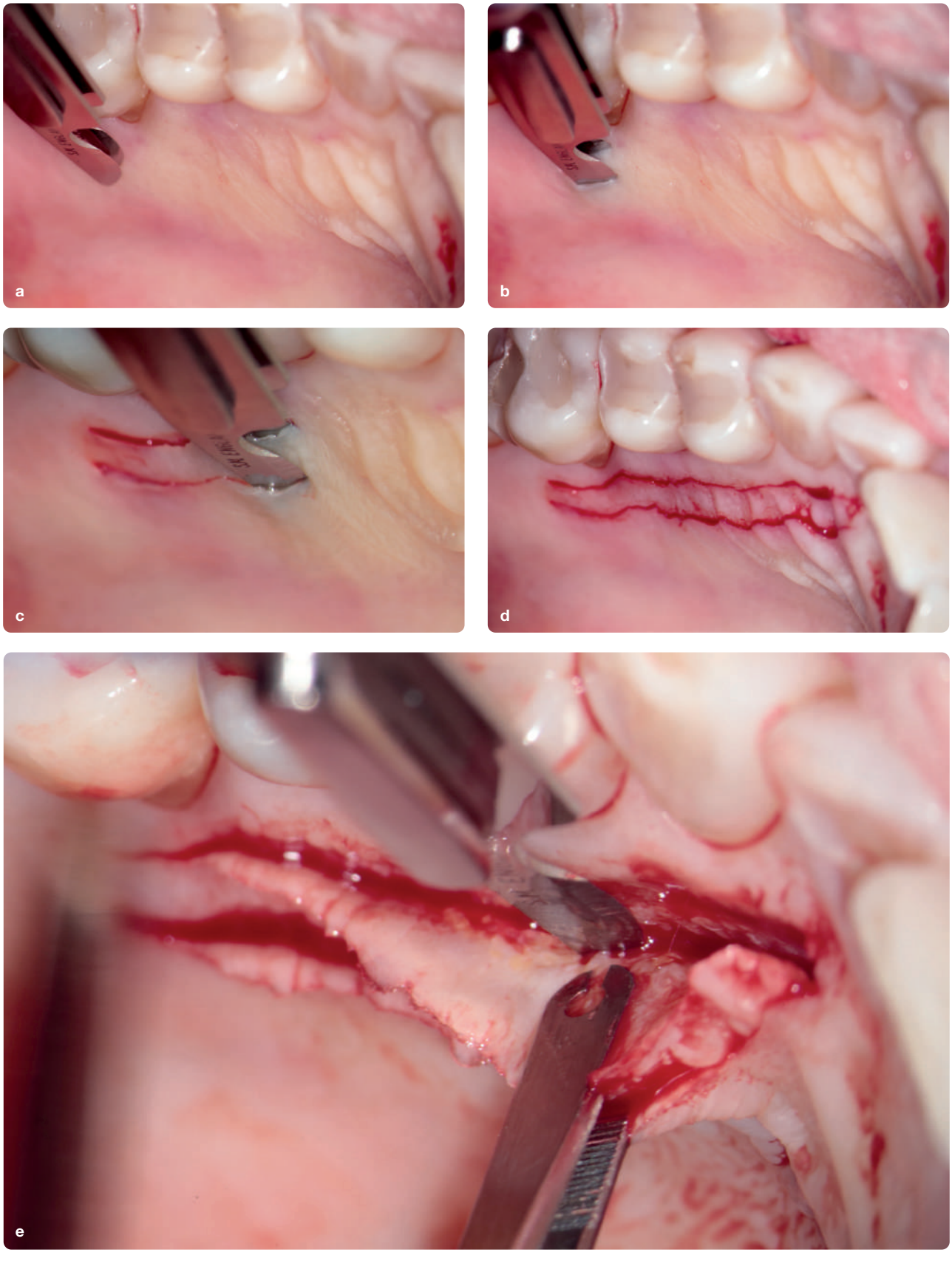


Fig 5-16 *(a to d)* Initial microincision with a double-blade scalpel. *(e)* Graft separation at the lateral ends and base using a single blade.

Fig 6-23 *(a)* Shallow recessions in adjacent teeth (maxillary right lateral incisor to left central incisor). *(b)* Surgical planning. MSM will precisely remove the gingival sulcus epithelium and favor graft adaptation. The incisal of the central incisors and left lateral incisor should be restored to achieve dentogingival esthetic harmony. *(c)* Initial MSM with the Castroviejo scalpel for removal of the gingival sulcus epithelium. *(d)* Beginning of flap microsplitting with the 6961 microblade.

4 Case

GINGIVAL FEATURES

Miller classification
I

Cairo classification
RT1

Periodontal phenotype
Thick scalloped

Keratinized tissue band
6 mm

DENTAL FEATURES

Reference for graft position
Present

Case 4

A 58-year-old woman presented with a 1-mm gingival recession on the maxillary right lateral incisor and 1.5-mm gingival recessions on the central incisors (Fig 6-23). The patient's complaint was the asymmetry of the gingival zeniths, causing esthetic disharmony. On clinical examination, it was observed that the gingival recessions were Miller Class I (Cairo RT1) with a thick scalloped periodontal phenotype, shallow abfraction-like NCCLs (< 1 mm deep), and incisal wear suggesting a parafunctional habit. There were also signs of mild gingivitis. After basic periodontal treatment and fabrication of a rigid protective nightguard, surgical planning was performed.